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EXAMINER	
SLOMSKI, REBECCA	

ART UNIT	PAPER NUMBER
2877	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Office Action Summary	Application No.	Applicant(s)
	10/663,300	VUONG ET AL.
	Examiner	Art Unit
	Rebecca C. Slomski	2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-20,22-28 and 30-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-20,22-28 and 30-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> **The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

Claims 10, 12, 25, and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

1. With respect to claim 10, it is unclear as to the relationship and meaning behind "global search algorithm" as far as the claims are concerned. There is no description in the specification in which one of ordinary skill in the art would understand the term and relationship to the limitations of the claim.

2. With respect to claims 12, 25, and 33, the term "smaller in size than a full library to be generated" is a relative term which renders the claim indefinite. The term "smaller in size than a full library to be generated" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. There is no specification for the size of the full library, therefore, one cannot ascertain a size that is smaller that such. .

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, 4, 5, 8, 10, 11,18, 19, 20, 22, 23, 24, 27, 28, 31, 32, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conrad et al. U.S. Patent # 5,963,329.

3. With respect to claim 1, Conrad et al. discloses a method for measuring the profile of small repeating lines comprising:

- Obtaining sample diffraction signals from measured diffraction signals of structures formed on the wafer, wherein the sample diffraction signals are a representative sampling of the measured diffraction signal (Col.4, L 32-36)
- Defining a hypothetical profile to model profiles of the structures formed on the wafer (Col.4, L 37-41)
- Evaluating the hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals (Col.4, L 41-45)
- Wherein obtaining sample diffraction signals comprises obtaining measured diffraction signals, where the measured diffraction signals are obtained from a plurality of locations on the wafer (Figure 13a, plurality of structures)
- Determining a sample index wherein the sample index corresponds to a number and a spacing of the sample diffraction signals (Table 1)
- Determining a cost distribution associated with determined sample index (Col. 5, L 30-38, smoothness of profile)

- Adjusting the sample index when the determined cost distribution dos not meet a cost criterion (Col.5, L 34-38, L 62-67)

4. With respect to claim 3, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

- The cost criterion is a percentage change in the cost distribution or a fixed quantity (Col.5, L 33-35)

5. With respect to claim 4, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

- Characterizing the hypothetical profile using two or more parameters (Col.5, L 53-57)

6. With respect to claim 5, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

- Accessing a sample diffraction signal from the obtained sample diffraction signals (Figure 1, 102)
- Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
- Determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal (Figure 1, 108)

- Modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion (Figure 1, 110)

7. With respect to claim 8, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

   - Obtaining a sample diffraction signal (Figure 1, 102)
   - Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
   - Determining a global minimum error (Figure 1, 108)
   - Modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion (Figure 1, 110, Col.4, L 50-53)

8. With respect to claim 10, Conrad et al. discloses all of the limitations of claims 1 and 8 above. In addition, Conrad et al. discloses:

   - Wherein the global minimum error is used to evaluate the performance of one or more global search algorithms (Figure 1, 108 and 110)

9. With respect to claim 11, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

   - Determining sensitivity for one or more parameters that characterize the hypothetical profile (Col.6, L 3-19, Col.7, L 49-53, optimization program)

- Modifying the hypothetical profile when the determined sensitivity is not acceptable or does not meet a sensitivity criterion (Col.6, L 20-27, Col.7, L 49-53, optimization program)

10. With respect to claim 18, Conrad et al. discloses all of the limitations as applied to claim 1 above. In addition, Conrad et al. discloses:

- Determining a measurement die pattern based on the sample diffraction signals wherein each location in the measurement die pattern corresponds to each location on the wafer from which the sample diffraction signals were obtained (Abstract)

11. With respect to claim 19, Conrad et al. discloses all of the limitations as applied to claims 1 and 18 above. In addition, Conrad et al. discloses:

- The measurement die pattern is used in advanced process control and process characterization (Col.11, L 30-36)

12. With respect to claim 20, Conrad et al. discloses a method for measuring the profile of small repeating lines comprising:

- Obtaining sample diffraction signals from measured diffraction signals of structures formed on the wafer, wherein the sample diffraction signals are a representative sampling of the measured diffraction signal (Col.4, L 32-36)

- Defining a hypothetical profile to model profiles of the structures formed on the wafer (Col.4, L 37-41)
- Evaluating the hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals (Col.4, L 41-45)
- Wherein obtaining sample diffraction signals comprises obtaining measured diffraction signals, where the measured diffraction signals are obtained from a plurality of locations on the wafer (Figure 13a, plurality of structures)
- Determining a sample index wherein the sample index corresponds to a number and a spacing of the sample diffraction signals (Table 1)
- Determining a cost distribution associated with determined sample index (Col. 5, L 30-38, smoothness of profile)
- Adjusting the sample index when the determined cost distribution dos not meet a cost criterion (Col.5, L 34-38, L 62-67)

The recitation of a computer readable storage medium containing computer executable code for the method has not been given patentable weight because it has been held that a preamble is denied the effect of a limitation where the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. Kropa v. Robie 88 USPQ 478 (CCPA 1951).

13. With respect to claim 22, Conrad et al. discloses all of the limitations as applied to claim 20 above. In addition, Conrad et al. discloses:

- Accessing a sample diffraction signal from the obtained sample diffraction signals (Figure 1, 102)
- Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
- Determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal (Figure 1, 108)
- Modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion (Figure 1, 110)

14. With respect to claim 23, Conrad et al. discloses all of the limitations as applied to claim 20 above. In addition, Conrad et al. discloses:

- Accessing a sample diffraction signal from the obtained sample diffraction signals (Figure 1, 102)
- Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
- Determining a global minimum error (Figure 1, 108)
- Modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion (Figure 1, 110, Col.4, L 50-53)

15. With respect to claim 24, Conrad et al. discloses all of the limitations as applied to claim 20 above. In addition, Conrad et al. discloses:

- Determining sensitivity for one or more parameters that characterize the hypothetical profile (Col.6, L 3-19, Col.7, L 49-53, optimization program)
- Modifying the hypothetical profile when the determined sensitivity is not acceptable or does not meet a sensitivity criterion (Col.6, L 20-27)

16. With respect to claim 27, Conrad et al. discloses all of the limitations as applied to claim 20 above. In addition, Conrad et al. discloses:

- Determining a measurement die pattern based on the sample diffraction signals wherein each location in the measurement die pattern corresponds to each location on the wafer from which the sample diffraction signals were obtained (Abstract)

17. With respect to claim 28, Conrad et al. discloses an apparatus for measuring the profile of small repeating lines comprising:

- A photometric device configured to obtain measured diffraction signals from structures formed on the wafer (Figure 9, detector 22b)
- A processing module configured to:
- Obtaining sample diffraction signals from measured diffraction signals of structures formed on the wafer, wherein the sample diffraction signals are a representative sampling of the measured diffraction signal (Col.4, L 32-36)
- Defining a hypothetical profile to model profiles of the structures formed on the wafer (Col.4, L 37-41)

- Evaluating the hypothetical profile using a sample diffraction signal from the obtained sample diffraction signals (Col.4, L 41-45)
- Wherein obtaining sample diffraction signals comprises obtaining measured diffraction signals, where the measured diffraction signals are obtained from a plurality of locations on the wafer (Figure 13a, plurality of structures)
- Determining a sample index wherein the sample index corresponds to a number and a spacing of the sample diffraction signals (Table 1)
- Determining a cost distribution associated with determined sample index (Col. 5, L 30-38, smoothness of profile)
- Adjusting the sample index when the determined cost distribution dos not meet a cost criterion (Col.5, L 34-38, L 62-67)

18. With respect to claim 30, Conrad et al. discloses all of the limitations as applied to claim 28 above. In addition, Conrad et al. discloses:

- Accessing a sample diffraction signal from the obtained sample diffraction signals (Figure 1, 102)
- Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
- Determining a goodness of fit between the sample diffraction signal and the simulated diffraction signal (Figure 1, 108)

- Modifying the hypothetical profile when the goodness of fit does not meet a goodness of fit criterion (Figure 1, 110)

19. With respect to claim 31, Conrad et al. discloses all of the limitations as applied to claim 28 above. In addition, Conrad et al. discloses:

- Accessing a sample diffraction signal from the obtained sample diffraction signals (Figure 1, 102)
- Determining a simulated diffraction signal corresponding to the sample diffraction signal (Figure 1, 104, 106)
- Determining a global minimum error (Figure 1, 108)
- Modifying the hypothetical profile when the global minimum error exceeds a global minimum error criterion (Figure 1, 110, Col.4, L 50-53)

20. With respect to claim 32, Conrad et al. discloses all of the limitations as applied to claim 28 above. In addition, Conrad et al. discloses:

- Determining sensitivity for one or more parameters that characterize the hypothetical profile (Col.6, L 3-19, Col.7, L 49-53, optimization program)

21. With respect to claim 35, Conrad et al. discloses all of the limitations as applied to claim 28 above. In addition, Conrad et al. discloses:

- Determine a measurement die pattern based on the sample diffraction signals wherein each location in the measurement die pattern corresponds to each

location on the wafer from which the sample diffraction signals were obtained (Abstract)

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 6, 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conrad et al. U.S. Patent # 5,963,329.

22. With respect to claims 6 and 9, Conrad et al. discloses all of the limitations as applied to claims 1, 5, and 8 above. However, Conrad et al. fails to disclose repeating the previous measurement steps for each sample diffraction signal. It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to repeat the measurement steps for each sample diffraction signal since the signals come from a plurality of locations on the wafer and each signal would need to be analyzed in order to determine a complete line profile of the grating and since mere repetition of previous actions involves only routine skill in the art.

23. With respect to claim 7, Conrad et al. discloses all of the limitations as applied to claims 1 and 5 above. In addition, Conrad et al. discloses:

- One diffraction signal form a range of sample diffraction signals is accessed for the steps above (Col.5, L 1-8)

However, Conrad et al. fails to specifically disclose the sample diffraction signal is closes to a center of a range of sample diffraction signals. It would have been obvious to one of ordinary skill in the art to choose the sample diffraction signal that is the median of a number of diffraction signals since that signal would therefore be more representative of all the signals. Choosing the median of a data set has a well-known advantage in the art in that it avoids the extreme data points.

Claims 12-17, 25, 26, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conrad et al. U.S. Patent # 5,963,329 in view of Ikeuchi U.S. Patent 6,952,818.

24. With respect to claims 12, 25 and 33, Conrad et al. discloses all of the limitations as applied to claims 1, 20 and 28 above. However, Conrad et al. fails to disclose one or more mini-libraries.

Ikeuchi discloses a method and system for optical proximity correction comprising:

- Generating one or more mini-libraries based on the obtained sample diffraction signals, wherein a mini-library is smaller in size than a full library to be generated (Figure 3B, 1st Library Registration, Layout Storage Medium 43, Test Pattern Storage Medium 40, Hazardous Point Storage Medium 48)
- Processing test diffraction signals using the one or more mini-libraries (Figure 3B, S 101, S102, S103, S104, S105)

- Estimating an averaged error and precision based on results of processing the test diffraction signals (Figure 3B, S107 and S108)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to use a mini-library to store information for the diffraction signals since it creates a flow in the system, saving time by avoiding needless repetition of steps and loss of data. (Ikeuchi, Col.2, L 11-32)

25. With respect to claim 13, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 1 and 12 above. However, Conrad et al. fails to disclose generating a full library if the error and precision are acceptable.

Ikeuchi discloses a method and system for optical proximity correction comprising:

- Determining if the estimated averaged error and precision are acceptable (Figure 3B, S108)
- Generating the full library when the estimated averaged error and precision are determined to be acceptable (Figure 3B, Library Storage Medium 41)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to use a mini-library to temporarily store information for the diffraction signals then when they are acceptable create a full library since it creates a flow in the system, saving time by avoiding needless repetition of steps and saving space (i.e. money) in the full library by only saving the acceptable data. (Ikeuchi, Col.2, L 11-32)

26. With respect to claim 14, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 1, 12 and 13 above. However, Conrad et al. fails to disclose providing the estimated averaged error and precision to a user.

Ikeuchi discloses a method and system for optical proximity correction comprising:

- Providing the estimated averaged error and precision to a user (Figure 2A, output unit 32, Figure 2E, lithography image output unit 14e)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to output the error and precision of the sample diffraction signal to a user so that the error can be correctly acknowledged, and whatever actions are necessary to prevent that error from continuing in the process, wasting time and money, can occur.

27. With respect to claim 15, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 1, 12 and 13 above. However, Conrad et al. fails to disclose the precision criterion is approximately one order of magnitude less than the error associated with a photometric device to be used with the full library.

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived that the precision criterion is approximately one order of magnitude less than the error associated with the device since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105, USPQ 233.

28. With respect to claim 16, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 1, 12 and 13 above. However, Conrad et al. fails to disclose processing test diffraction signals using the full library and estimating an error and precision for the full library.

Ikeuchi discloses a method and system for optical proximity correction comprising:

- Processing test diffraction signals using the generated full library (Figure 3E, S133)
- Estimating an averaged error and precision for the full library based on results of processing the test diffraction signals (Figure 3E, S136)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to process diffraction signals using the full library and then estimating an averaged error and precision thereof since the full library only consists of those sample signals with an acceptable error, so processing test diffraction signals from the acceptable sample signals would increase the precision and then estimating the error of the entire full library would prevent the continuation of an unacceptable error range.

29. With respect to claim 17, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 1, 12 and 13 above. In addition, Conrad et al. discloses:

- Altering the range and/or resolution of one or more parameters that characterize the hypothetical profile when the estimated averaged error and precision are not acceptable (Col.6, L 20-27, Col.7, L 49-53, optimization program)

30. With respect to claims 26 and 34, Conrad et al. in view of Ikeuchi discloses all of the limitations as applied to claims 20, 25 and 33 above. In addition, Conrad et al. discloses:

- Altering the range and/or resolution of one or more parameters that characterize the hypothetical profile when the estimated averaged error and precision are not acceptable (Col.6, L 20-27, Col.7, L 49-53, optimization program)

However, Conrad et al. fails to disclose generating a full library if the error and precision are acceptable.

Ikeuchi discloses a method and system for optical proximity correction comprising:

- Determining if the estimated averaged error and precision are acceptable (Figure 3B, S108)
- Generating the full library when the estimated averaged error and precision are determined to be acceptable (Figure 3B, Library Storage Medium 41)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to use a mini-library to temporarily store information for the diffraction signals then when they are acceptable create a full library since it creates a flow in the system, saving time by avoiding needless repetition of steps and saving space (i.e. money) in the full library by only saving the acceptable data. (Ikeuchi, Col.2, L 11-32)

Response to Arguments

31. Applicant's arguments, see Page 10-12, filed July 11, 2007, with respect to the rejection(s) of claim(s) 1-35 under 25 USC 102 and and 35 USC 103 as well as objections to claims 10 and 19 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Conrad et al. and further in view of Ikeuchi.

Citation

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Yuzo et al. JP Publication 2003-059991 discloses a visual inspection system
- Tomonobu JP Publication 2001-37047 discloses a simulated defect wafer

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rebecca C. Slomski whose telephone number is 571-272-9787. The examiner can normally be reached on Monday through Thursday, 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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